

beam directed between 0.5 degrees and 1.5 degrees of the stationary orbit.

(b) *12.7-13.25 GHz.* No directional transmitting antenna utilized by a fixed station operating in this band shall be aimed within 1.5 degrees of the geostationary-satellite orbit, taking into account atmospheric refraction. However, exception may be made in unusual circumstances upon a showing that there is no reasonable alternative to the transmission path proposed. If there is no evidence that such exception would cause possible harmful interference to an authorized satellite system, said transmission path may be authorized on waiver basis where the maximum value of the equivalent isotropically radiated power (EIRP) does not exceed +45 dBW for any antenna beam directed within 1.5 degrees of the stationary satellite orbit.

(c) Methods for calculating the azimuths to be avoided may be found in: CCIR Report No. 393 (Green Books), New Delhi, 1970; in "Radio-Relay Antenna Pointing for controlled Interference With Geostationary-Satellites" by C.W. Lundgren and A.S. May, *Bell System Technical Journal*, Vol. 48, No. 10, pp. 3387-3422, December 1969; and in "Geostationary Orbit Avoidance Computer Program" by Richard G. Gould, Common Carrier Bureau Report CC-7201, FCC, Washington, DC, 1972. This latter report is available through the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22151, in printed form (PB-211 500) or source card deck (PB-211 501).

[52 FR 7145, Mar. 9, 1987]

#### § 78.107 Equipment and installation.

(a) Applications for new cable television relay stations, other than fixed stations, will not be accepted unless the equipment specified therein has been certificated. In the case of fixed stations, the equipment must be authorized under the verification procedure for use pursuant to the provisions of this subpart. Transmitters designed for use in the 31.0 to 31.3 GHz band shall be authorized under the verification procedure.

(1) All transmitters first licensed or marketed shall comply with technical standards of this subpart. This para-

graph (b)(1) of this section is effective October 1, 1981.

(2) Neither certification nor verification is required for the following transmitters:

(i) Those which have an output power not greater than 250 mW and which are used in a CARS pickup station operating in the 12.7-13.2 GHz band; and

(ii) Those used under a developmental authorization.

(b) Cable television relay station transmitting equipment authorized to be used pursuant to an application accepted for filing prior to October 1, 1981, may continue to be used, provided, that if operation of such equipment causes harmful interference due to its failure to comply with the technical standards set forth in this subpart the Commission may, at its discretion, require the licensee to take such corrective action as is necessary to eliminate the interference.

(c) The installation of a CARS station shall be made by or under the immediate supervision of a qualified engineer. Any tests or adjustments requiring the radiation of signals and which could result in improper operation shall be conducted by or under the immediate supervision of a person with required knowledge and skill to perform such tasks.

(d) Simple repairs such as the replacement of tubes, fuses, or other plug-in components which require no particular skill may be made by an unskilled person. Repairs requiring replacement of attached components or the adjustment of critical circuits or corroborative measurements shall be made only by a person with required knowledge and skill to perform such tasks.

[37 FR 3292, Feb. 12, 1972, as amended at 45 FR 78695, Nov. 26, 1980; 49 FR 4001, Feb. 1, 1984; 49 FR 20672, May 16, 1984; 50 FR 7343, Feb. 22, 1985; 63 FR 36606, July 7, 1998; 63 FR 49870, Sept. 18, 1998]

#### § 78.108 Minimum path lengths for fixed links.

(a) The distance between end points of a fixed link must equal or exceed the value set forth in the table below or the EIRP must be reduced in accordance with the equation set forth below.

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Frequency band (MHz)	Minimum path length (km)
12,200 to 13,250 .....	5
Above 17,700 .....	N/A

(b) For paths shorter than those specified in the Table, the EIRP shall not exceed the value derived from the following equation.

$$\text{EIRP} = 30 - 20 \log [A/B], \text{ dBW}$$

Where:

EIRP=equivalent isotropic radiated power in dBW.

A=Minimum path length from the Table for the frequency band in kilometers.

B=The actual path length in kilometers.

(c) Upon an appropriate technical showing, applicants and licensees unable to meet the minimum path length requirement may be granted an exception to these requirements.

NOTE: Links authorized prior to April 1, 1987, are excluded from this requirement, except that, effective April 1, 1992, the Commission will require compliance with the criteria where an existing link would otherwise preclude establishment of a new link.

[52 FR 7145, Mar. 9, 1987]

**§ 78.109 Equipment changes.**

(a) Formal application is required for any of the following changes:

(1) Any increase in emission bandwidth beyond that authorized;

(2) Any change in the transmitting antenna system of a station, other than a CARS pickup station, including the direction of the main radiation lobe, directive pattern, antenna gain or transmission line;

(3) Any horizontal change in the location of the antenna, other than a CARS pickup station, transmitter.

(4) Any change in the type of modulation;

(5) Any change in the location of a station transmitter, other than a CARS pickup station transmitter, except a move within the same building or upon the tower or mast or a change in the area of operation of a CARS pickup station.

(6) Any change in frequency assignment, including polarization;

(7) Any change in authorized operating power.

(b) Other equipment changes not specifically referred to in paragraph (a) of

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this section may be made at the discretion of the licensee, provided that the Engineer in Charge of the radio district in which the station is located and the Commission in Washington, DC, are notified in writing upon the completion of such changes and provided further, that the changes are appropriately reflected in the next application for renewal of licenses of the station.

(c) Any application proposing a change in the height of the antenna structure or its location shall include the Antenna Structure Registration Number (FCC Form 854R) of the structure upon which it proposes to locate its antenna. In the event the antenna structure does not have a Registration Number, the owner of the antenna structure shall file an FCC Form 854 ("Application for Antenna Structure Registration") in accordance with part 17 of this chapter or the applicant shall provide a detailed explanation as to why registration and clearance are not required.

[37 FR 3292, Feb. 12, 1972, as amended at 38 FR 6827, Mar. 3, 1973; 41 FR 29696, July 19, 1976; 61 FR 4368, Feb. 6, 1996]

**§ 78.111 Frequency tolerance.**

Stations in this service shall maintain the carrier frequency of each authorized transmitter to within the following percentage of the assigned frequency.

Frequency band (MHz)	Frequency tolerance	
	Fixed (percent)	Mobile (percent)
1,990 to 2,110 .....	.....	0.005
6,425 to 6,525 .....	.....	0.005
6,875 to 7,125 .....	.....	0.005
12,700 to 13,250 <sup>1</sup> .....	0.005	0.005
17,700 to 18,820 .....	0.003	.....
18,820 to 18,920 .....	0.001	.....
18,920 to 19,700 .....	0.003	.....
31,000 to 31,300 .....	0.05	0.05

<sup>1</sup> Stations that employing vestigial sideband AM transmissions shall maintain their operating frequency within 0.0005% the visual carrier, and the aural carrier shall be 4.5 MHz± 1 kHz above the visual carrier frequency.

[52 FR 7145, Mar. 9, 1987]

**§ 78.113 Frequency monitors and measurements.**

(a) The licensee of each CARS station shall employ a suitable procedure to determine that the carrier frequency of each transmitter is maintained within